LIVERMORE LAB REPORT

A weekly compendium of media reports on science and technology achievements at Lawrence Livermore National Laboratory, Aug. 25-29, 2014. Though the Laboratory reviews items for overall accuracy, the reporting organizations are responsible for the content in the links below.

THE DAILY GALAXY

CALCULATING THE BIRTH OF THE UNIVERSE

This galactic snapshot is part of a collage of close-ups pulled from the Ultra Deep Field of the Hubble Space Telescope. Photo courtesy of NASA/ESA/S. Beckwith (STScI) and HUDF Team.

Using a calculation originally proposed seven years ago to be performed on a petaflop computer, Lawrence Livermore researchers computed conditions that simulate the birth of the universe.

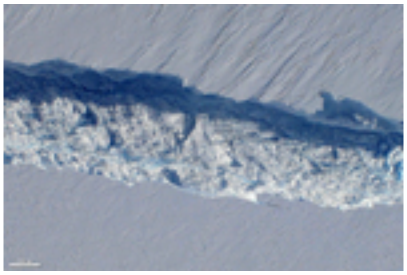
When the universe was less than one microsecond old, it transformed from a plasma of quarks and gluons into bound states of quarks - also known as protons and neutrons, the fundamental building blocks of ordinary matter that make up most of the visible universe.

Lawrence Livermore scientists Chris Schroeder, Ron Soltz and Pavlos Vranas calculated the properties of the quantum chromodynamics phase transition using LLNL's Vulcan, a five-petaflop machine.

"But with the invention of petaflop computing, we were able to calculate the properties with a theory proposed years ago when petaflop-scale computers weren't even around yet," Soltz said.

To read more, go to Daily Galaxy.

GOING BIG ON CLIMATE



Lawrence Livermore scientists will examine the onset of the collapse of the Antarctic Ice Sheet as part of a new supercomputing climate project.

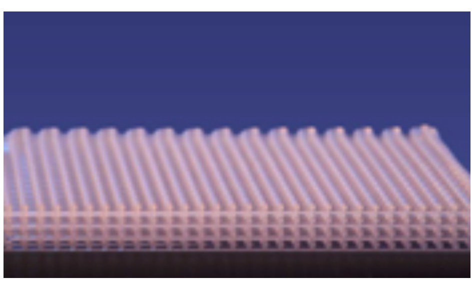
Lawrence Livermore high-performance computing researchers are pooling their number-crunching capabilities to provide what they hope will be the most complete climate and Earth system models to date.

Among those models would be the first fully coupled global simulation to include dynamic ice shelf/ocean interactions that could help explain potential instabilities of the marine ice sheets around Antarctica.

The Accelerated Climate Modeling for Energy (ACME) project is sponsored by the Earth System Modeling program in DOE's Office of Biological and Environmental Research, with initial funding provided by the Office of Science. Lawrence Livermore is the lead organization.

To read more, go to [FCW](FCW).

IT'S CUSHIONY



A silicone cushion with programmable mechanical energy absorption properties was produced through a 3D printing process using a silicone-based ink by Lawrence Livermore researchers.

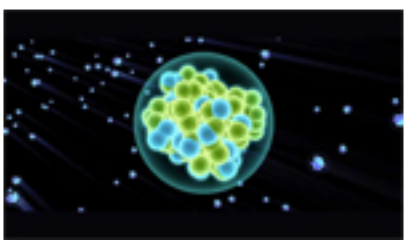
Cushioning or padding is utilized to dampen shock and vibrations, distribute and relieve stress, maintain relative positioning or mitigate the effect of size variation. But their ubiquitous nature has led to a thorough study of their uses, characteristics, strengths and weaknesses.

In an attempt to create a better product, engineers and scientists at Lawrence Livermore worked together to create an entirely new way of producing a cushioning material. Their approach was to work at the microscale and fabricate a material with a number of programmable properties that could be manipulated to create the desired characteristics.

These new materials are produced using an additive manufacturing technique called direct ink writing with a silicone-based ink that cures into a material much like rubber.

To read more, go to 3Dprint.com.

AMERICAN Scientist **THE ELEMENTAL PATH**



Element 117, first discovered by Lawrence Livermore researchers and Russian collaborators, has been reproduced by an international consortium this year. The International Union of Pure and Applied Chemistry (IUPAC) must accept the confirmation before the element is named.

More than 100 years ago, a young physicist named Henry Moseley gave new life to the periodic table of the elements, and helped resolve a number of problems in chemistry and physics. Despite his abbreviated life (he died in service during World War I), Moseley's work continues to influence the world of chemistry. In fact, his research is more influential than ever today, as new elements are being synthesized and added to the periodic table, such as the yet-to-be-named elements 115 and 118.

Lawrence Livermore scientists, in conjunction with Russian researchers, discovered elements 115 and 118, in 2004 and 2005, respectively. A total of six new elements have been discovered by the Dubna-Livermore team (113, 114, 115, 116, 117 and 118, the heaviest element to date).

Although many of these elements are too unstable to be of commercial importance, their synthesis provides new understanding of nuclear stability and radioactivity, especially under extreme conditions of very high charge, and also can be used to test relativistic quantum theories of atoms.

To read more, go to *American Scientist*.

YAHOO! NEWS DIAMONDS ARE FOREVER INSIDE GIANT PLANETS

The interior of the target chamber at the National Ignition Facility at Lawrence Livermore National Laboratory. Researchers recently used NIF to study the interior state of giant planets. Image by Damien Jemison/LLNL

The biggest laser in the world, housed at Lawrence Livermore, was used to crush a diamond, offering insights into how the hardest known material behaves when it is exposed to extremely high pressures. The experiment conducted at the National Ignition Facility also could reveal new clues about what happens at the cores of giant planets, where conditions of intense atmospheric pressures exist.

Researchers at Lawrence Livermore blasted a sliver of diamond with a laser beam at a pressure of 725 million pounds per square inch (51 million kilograms per square centimeter). This is the kind of pressure found near the core of giant planets, such as Jupiter, or huge, rocky bodies known as "super-Earths."

The entire experiment took only 25 billionths of a second. The researchers fired 176 laser beams at a small cylinder of gold, called a hohlraum, with a tiny chip of synthetic diamond embedded in it. When the laser beams hit the cylinder, the energy was converted to X-rays. The hohlraum was vaporized, and in the process, the diamond was exposed to pressures tens of millions of times Earth's atmospheric pressure.

To read more, go to Yahoo News.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the Livermore Lab Report, send email.